Payback, NPV and IRR of an Energy-Saving Project

Simple payback, net present value and internal rate of return of a heat-recovery or energy-saving project from its cost, annual saving, discount rate and life.

Method: Discounted cash flow (end-of-year convention); standard engineering economics

Input parameters

Unit system: SI

Parameter	Value	Unit
Investment (your currency)	6,000,000	
Annual saving (your currency per year)	2,400,000	
Annual operation and maintenance cost	100,000	
Discount rate	10.000	%
Life of the project (years)	15.000	

Calculated results

Parameter	Value	Unit
Simple payback (years)	2.6087	
Net present value (your currency)	1.1494e+07	
Internal rate of return	38.029	%
Net annual saving	2,300,000	

Formula and method

$$PB = \frac{I}{S - M} \qquad NPV = -I + \sum_{k=1}^{n} \frac{S - M}{(1 + r)^k} \qquad 0 = -I + \sum_{k=1}^{n} \frac{S - M}{(1 + IRR)^k}$$

Variables

I	investment, your currency	–
S	annual saving	–
M	annual operation and maintenance cost	–
r	discount rate	–
n	life of the project, years	–
PB	simple payback, years	–
NPV	net present value	–
IRR	internal rate of return	–
$S - M$	net annual saving	–
k	year number	–

Method and standards

Discounted cash flow with equal net savings at the end of each year; the IRR is the discount rate at which the NPV is zero, found by bracketed root finding.

Assumptions and limits

- Equal savings every year; no salvage value, tax or inflation.
- Investment at the start of year one; whole years of life.
- Discount rate from 0 up to (not including) 100 %. An IRR outside −99 % to 1 000 % is not shown.

References

- Discounted cash flow (end-of-year convention)
- standard engineering economics

Report details

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Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/general/economics/heat-recovery-payback

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.